

and the large number of highly paid specialist teachers who ought to be employed therein.

At present there is no technical institution in the United Kingdom which is staffed on a scale even approximately equal to that of such foreign institutions as the Charlottenburg Technical High School, Berlin, and the Massachusetts Institute of Technology, Boston. In these magnificent technical high schools, in place of two or three professors, *e.g.*, of engineering, we find a very large number of highly qualified men, each dealing with some special branch of engineering knowledge, and this can be economically done because of the very large number of engineering students gathered together in one institution. In this country, at present our comparatively few adult engineering day students are scattered among a relatively large number of institutions; as a result, such far-reaching subjects as electrical engineering have to be entrusted to a single professor. Indeed, there are some technical colleges in which there is only one professor of engineering, and electrical engineering is in charge of a poorly paid assistant lecturer.

To remedy this, coordination of work is necessary, not merely within the great towns, but even between neighbouring educational authorities, which are not infrequently jealous of one another and pursue their work regardless of what is going on around them. Hence we have cases of towns within easy reach of one another where technical institutions have been established, each of which tries to do the highest possible work in all the subjects which it undertakes. The result is a small number of students in each subject in each town and a staff of teachers proportionate, it is true, to the number of students, but inadequate for the purposes of advanced technical education. It would be well, therefore, if power were given to the Board of Education to select a limited number of central institutions where alone higher technical education in the day-time should be given.

Liberal financial aid will be needed to place such institutions on a satisfactory basis, and as they will be national rather than local institutions, a large part of the money for their support should be provided from the imperial exchequer; the remainder should be contributed by the various local authorities in the districts which they serve.

Another important matter which must be determined is the relation of institutions providing the highest kind of technical training to the universities or university colleges in the same district. The best solution of this problem in such a case as, *e.g.* Manchester would be for the technical institution to absorb all the higher technical work of the city and for the university college to devote itself to the faculties of theology, literature, philosophy, medicine, law, pure science, music, &c. Where local universities are established, the technical institution would become the faculty of technology and commerce; it should not be subjected to the academic control of the university, which might tend to destroy its usefulness for industrial and commercial purposes.

The great technical institutions of Germany and America exist side by side with important universities; they are, however, independent of these, and it is partly to this fact that they owe their usefulness in promoting the industrial progress of the German and American nations.

An important problem for the new local educational authorities will be the training of teachers of trade subjects. It is easy to find men with a good knowledge of their respective trades, or persons who can teach well, with a superficial knowledge of an industry, but the combination of these qualifications is comparatively rare. It is not easy to see how this can be speedily remedied, but an improvement might be produced by arranging a higher scale of remuneration for teachers of trade subjects who had passed examinations giving evidence of

their power to explain in simple language matters connected with their own industry. More than this it is probably impossible to demand at present.

As regards the more highly qualified teachers needed for adult day classes in technical institutions, one of the greatest difficulties is how best to keep such men in touch with their respective industries. If the teacher's whole time is not required for the work of the institution, he can remain in contact with the industry by doing consulting work and by research. Unfortunately, in such cases there is often a tendency for him to regard his teaching work as the least important part of his occupation; in fact, one has known cases where the principal value of such a teacher to his students has been the fact that his name was well known in the industry and his recommendation consequently a valuable one, though his actual teaching work was of a merely nominal character. The cure for this would be to make the pay which the teacher receives for teaching by far the largest part of his income; such an arrangement would, however, mean a considerable increase in the salaries of teachers of technical subjects, but, in the opinion of the writer, it would be justifiable, as it would make it possible for some of the best men to continue teachers; at present, such men are attracted to the industries by the incomparably larger financial prizes which they offer.

J. WERTHEIMER.

PREVENTION OF RABIES.

A LETTER headed "Mr. Hanbury admits the failure of the muzzle" has been addressed to us by a member of the executive committee of the National Canine Defence League, which letter, as might be expected, urges in so many words on behalf of the canine species the total abolition of the muzzling order at all times and under all conditions. The writer of the letter vindicates for himself, as might also be expected, a superior knowledge concerning rabies, its nature and its mode of spread; he, as a matter of course, is one "who understands dogs" and considers "that the muzzle was from the first condemned as useless cruelty." According to this authority, the Board of Agriculture, including, we presume, its veterinary department, "itself ignorant of dogs and their diseases, has persistently refused to be advised and guided by those who do possess the requisite knowledge" (*sic*!).

To be serious, it is no new thing that there never is any lack of amateurs who, notwithstanding the obvious want of special knowledge required to form an opinion, are in their own estimation quite capable of judging of the merits or demerits of a question that can be only dealt with adequately by the specialist possessed of the requisite knowledge.

Rabies is an infectious disease, directly communicated by the bite of a rabid animal, in the vast majority of cases a rabid dog. In the interest of the animals themselves—all domestic animals are susceptible to the disease—and above all in the interest of human beings, the disease should be, and as a matter of fact has been, controlled, checked and prevented from spreading by the thorough, not half-hearted, carrying out of the muzzling order: that is, the slaughter of ownerless and stray dogs—the most dangerous because the most frequent means of contagion—and by the muzzling, not merely the pretence of muzzling, of all dogs, so as to include also those that may and sometimes do harbour the contagium before the actual disease has fully declared itself in them. Such is the practice, the only rational practice, which is followed, and successfully followed, in other countries at times when rabies makes its appearance. The private opinion of Mr. Hanbury or any other politician on this subject, and the complaint that—owing, most probably, to the loose and half-hearted manner of

administering the muzzling order—rabies has not been stamped out in Wales, does not touch the real merits of the question.

Mr. Long, the former President of the Board of Agriculture, who has proved himself thoroughly well instructed in the whole question of rabies, has with laudable firmness resisted the outcry and the repeated assaults of the uninstructed sentimentalists, and as a result was able to demonstrate that by the strict carrying out of the muzzling order rabies in England was checked and was almost reduced to extinction, though at first it was so prevalent as to be really alarming. It seems hopeless to discuss this or any other dog-question with people who, in the face of all expert opinion as regards prevention of rabies, and particularly against the opinion of sensible owners of dogs, can write that "the muzzling order and the muzzle are a gross and wanton cruelty to animals."

But even if it were not an exaggeration, as we are persuaded it is, that the owners of dogs in general object to the muzzling order and consider it a cruelty to animals, what about the human species? Human beings who are not members of the executive committee of the National Canine Defence League regard the muzzling order as an important safeguard. One of the duties of the State is to protect the health and lives of its citizens. Hydrophobia of man is one of the most terrible diseases, and the slaughter of stray dogs and the muzzling of all dogs in places where rabies is rife has been proved to be at present the best and only means to prevent the spread of the disease to man. Besides, it should be the interest of owners of valuable animals to insist on the retention and strict carrying out of a measure which to a very large extent insures against the spread of rabies and consequent loss—seemingly of indifference to the members of the Canine Defence League.

RECENT WORK OF THE GEOLOGICAL SURVEY.

THE Report referred to below¹ shows that the Geological Survey continues with activity and success its investigation of the geology of these islands. It bears witness to a large amount of steady and useful routine work, which may not make much show, but which will contribute to our knowledge of the detailed structure of these islands and in some instances will have direct economic usefulness. Among the more interesting scientific results of the year's work, the progress of the re-examination of Cornwall has brought to light evidence of a younger granite than the main mass of that rock, showing that the granitic intrusions form a somewhat more complex series than had been supposed. The clue, however, to the detailed structure of the so-called "killas" and the boundaries between the true Devonian and older rocks still eludes the keen eyes with which the surveyors are searching for it. If we could hope that the appointment of a mining geologist would do anything towards reviving the decayed mining industry of the region, we should still more rejoice in this increase to the strength of the staff. Another of the problems which for years past has baffled the officers of the Survey is that of the Old Red Sandstone of South Wales. They are still unable to draw any satisfactory line between the lower and upper divisions of the system. If the key is not found before the western coast is reached, we can hardly hope that it will be discovered in any part of this region.

Some interesting discoveries were made during the year in Scotland. Foremost among these is the finding of proof that the granite of south-west Argyllshire has

invaded and altered a portion of the Lower Old Red Sandstone series of Lorne. The importance of this new fact lies in its relation to the history of the metamorphism and igneous protrusions of the Scottish Highlands, for it shows that some of the granitic masses, like those of Galloway and Leinster, are certainly post-Silurian in age. Another notable "find" is that of the zone of *Pecten asper* in the island of Scalpay and of Upper Cretaceous rocks in the sound of Soay.

In Ireland, the energies of the Survey are now concentrated on the Drift, with the view of preparing accurate maps of the superficial deposits of the country. But under Mr. Lamplugh's direction, the geological interest of the glacial geology is not likely to be lost sight of. One of the features of the work in the Dublin district was the finding of evidence which seems to support the view that the eskers represent water-channels which existed under the ice-sheet.

A new arrangement has been made in this Summary. Its materials are grouped by districts instead of, as formerly, by formations. The change will no doubt save trouble in the preparation of the volume, but it gives a great deal more to the geologist who wishes to ascertain what additions to our knowledge the Survey has been able to make in any particular part of the geological record. Another change is the omission of the Director's name from the book. It surely cannot have been the wish of those who wield the new brooms at South Kensington to sweep Mr. Teall's name clean out of his Report.

PROF. P. P. DÉHERAIN.

DÉHERAIN (b. 1830, d. 1902), who in 1887 succeeded to Boussingault's place in the Académie des Sciences, was, for the last twenty-two years of his life, professor of vegetable physiology as applied to agriculture at the Muséum in Paris. His early work was chiefly agricultural, and included researches on calcium phosphate, on the salts of potassium, &c.; he was author of a "Cours de Chimie agricole," and it should not be forgotten that he founded the *Annales agronomiques*. In the region of pure physiology, he was author of a number of memoirs, of which those written in collaboration with Maquenne, Moissan and others are perhaps especially well known. He worked at gaseous interchange, including the absorption of oxygen by succulents and by oily seeds, also at the assimilation of CO₂, being especially interested in the action of the different parts of the spectrum on this process. His researches extended to other subjects, such as transpiration, the assimilation of free nitrogen and denitrification.

A sympathetic appreciation of his personal character and of his career as a teacher is given by his former pupil, Maquenne, in *La Nature* of December 13, to which we acknowledge our indebtedness. Although Déherain's name is not associated with any great discovery, he deserves the place he won for himself in the annals of plant-physiology and the honour due to one who dies in harness.

F. D.

TRANSATLANTIC WIRELESS TELEGRAPHY.

MR. MARCONI'S latest success is a wonderful achievement. Messages have been exchanged in both directions across the Atlantic, between his two new stations at Glace Bay, Cape Breton, and Poldhu, Cornwall. Transatlantic wireless telegraphy has thus been successfully established; and the persistent effort which has enabled this result to be accomplished merits the fullest recognition. The messages which we print from the *Times* represent the inauguration of a system of

¹ "Summary of Progress of the Geological Survey of the United Kingdom and Museum of Practical Geology for 1901."